

## **REMARKS**

Claims 1-29 are pending in this application. Claims 1, 7, 9, and 21 have been amended to more particularly point out and distinctly claim Applicants' invention.

Applicants note that although the Examiner has rejected claims 1-29, the PTOL-326 form accompanying the Office Action mailed August 31, 2005 lists only claims 1-21 as pending. Also, the Examiner has not indicated on the PTOL-326 form whether the drawings filed December 16, 2004 were accepted. Appropriate indication in the next Office Action is respectfully requested.

## **Claim Rejections**

### **Rejection Under 35 U.S.C. §112**

#### **A. Response to rejection of claims 7 and 9 under 35 U.S.C. §112 as being indefinite.**

In response to the rejection of claims 7 and 9 under 35 U.S.C. §112, second paragraph, as being indefinite, Applicants have replaced the "obtained by" phrasing with "produced by" as suggested by the Examiner. Reconsideration and withdrawal of the rejection respectfully is requested.

### **Rejection Under 35 U.S.C. § 103**

#### **B. Response to Rejection of claims 1-29 under 35 U.S.C. §103(a) as being unpatentable over Hieda et al.**

In response to the rejection of claims 1-29 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,804,676 of Hieda et al. ("Hieda"), Applicants submit that a *prima facie* case of obvious has not been made out by the Examiner.

In order to establish a *prima facie* case of obviousness, the Examiner must establish all three of the following essential criteria: (1) the prior art reference must teach or suggest all the claim limitations; (2) there must be some suggestion or motivation to modify the reference; and (3) there must be a reasonable expectation of success (MPEP §2143). Also, the mere fact that the reference can be combined or modified does not render the resultant combination obvious

unless the prior art also suggests the desirability of the combination (MPEP §2143.01).

In a first embodiment of the invention, the present invention relates to a method for continuously removing unreacted butene-1 and optionally other volatile components from a polymeric solution produced by liquid phase (co)polymerization of butene-1, the method comprising the steps of:

- a) subjecting the polymeric solution to heating and mixing conditions such that a mixture is formed consisting essentially of: (1) a polybutene melt containing entrapped butene-1 and (2) supercritical gaseous butene-1; and
- b) subjecting the mixture of step a) to a sequence of devolatilization steps operating at decreasing pressures and at temperatures comprised between 170 and 220°C.

In a second embodiment, the present invention relates to a method for continuously removing unreacted monomer and optionally other volatile components from a polymeric solution produced by a liquid-phase (co)polymerization of butene-1, the method comprising the steps of:

- a<sub>1</sub>) subjecting the polymeric solution to heating and mixing conditions so as to cause part of the butene-1 to separate from the solution, thereby forming a product of step a<sub>1</sub>;
- a<sub>2</sub>) subjecting the product of step a<sub>1</sub>) to a further heating such that a two-phase mixture is formed consisting essentially of: (1) a polybutene melt containing entrapped butene-1 and (2) supercritical gaseous butene-1; and
- b) subjecting the two-phase mixture of step a<sub>2</sub> to a sequence of devolatilization steps operating at decreasing pressures and at temperatures comprised between 170 and 220°C.

In a third embodiment, the present invention relates to a process for obtaining butene-1 (co)polymers comprising the following steps:

- a) (co)polymerizing butene-1 in liquid phase in the presence of a catalyst system based on a transition metal compound to obtain a solution of polybutene-1 in butene-1;
- b) removing an amount of unreacted butene-1, optionally together with other volatile components, from said solution by
  - (I) subjecting the solution to heating and mixing conditions such that a mixture is formed consisting essentially of: (1) a polybutene melt containing entrapped butene-1 and (2) a supercritical gaseous butene-1;
  - (II) subjecting the mixture of step (I) to a sequence of devolatilization steps operating

at decreasing pressures and at temperatures comprised between 170 and 220°C .

In contrast, Hieda, clearly does not teach or suggest all the elements of the claimed invention. Hieda relates to a methyl methacrylate polymerization reaction, and certainly does not teach a mixture consisting essentially of a polybutene melt containing entrapped butene-1 and a supercritical gaseous butene-1. In fact, in describing the monomer component for use in Heida's invention, the reference recites that "in the monomer mixture...there are not substantially contained an unsaturated aliphatic hydrocarbon such as ethylene." (col. 8, lines 9-15). Butene-1 obviously is an unsaturated aliphatic hydrocarbon. Further, the technical solution adopted in Heida to achieve the removal of the volatile components is based on the use of an extruder endowed with vent openings, and not on the use of a sequence of devolatilization chambers as claimed in the present invention. Thus, in Heida's process the volatile components are released via the vent openings while the polymeric solution is pushed by the screw of the extruder inside the extruder chamber. In the process of the present invention, the volatile components are separated by gravity while the polyolefin melt pours downward inside the devolatilization chambers (description on page 9, lines 15-17) The specification of the present invention recites as one of its advantages the avoidance of a vented extruder (page 8). Finally, nowhere does the reference teach or disclose a polybutene melt containing entrapped butene-1 and supercritical gaseous butene-1. In fact, in discussing Japanese Patent Application Laid-open No. 194004/1990, the reference criticizes the application of a supercritical state, indicating that it "leads to many problems such as the increases in the cost of facilities." (col. 4, line 66 to col. 5, line 7).

In particular, with respect to dependent claims 3, 11, 13, 14, 17, 19, 22, 23, 26, and 28, Heida certainly does not teach specific concentrations of butene-1 in polybutene. Further, Heida's vented extruder system describes a system with a screw of an extruder being fed through a feed opening substantially maintained at atmospheric pressure (col. 5, lines 51-53), with downstream vents set to vent pressures of 1 to 400 mmHg (col. 6, line 19). The nearly atmospheric pressure is defined as being in the range of 230 to 2280 mm Hg (col. 13, lines 55-56). Thus, with respect to dependent claims 5 and 6, Heida certainly does not teach a pressure in the first volatilizer higher than atmospheric.

Therefore, the reference does not teach all the elements of the present invention.

Heida also does not provide any motivation to modify its teaching to arrive at the present invention. As discussed above, Heida discloses a methyl methacrylate polymerization system, and excludes substantial quantities of unsaturated aliphatic hydrocarbons. In addition, modifying Heida to arrive at the present invention would require the use of supercritical conditions, which the reference criticizes. Therefore, to modify the reference as suggested by the Examiner would render it unsatisfactory for its intended purpose (MPEP 2143.01). Finally, the reference teaches away from devolatilization steps of the present invention, because it teaches a vented extruder, which is completely different than the disclosure of the present invention. Therefore, no motivation exists to modify the reference as suggested by the Examiner.

Finally, there is no reasonable expectation of success in modifying the reference as suggested by the Examiner. The fact that Heida's methyl methacrylate material is a completely different polymer system than butene-1, that Hieda's vented system is completely different than the present invention, and that Hieda criticizes the use of supercritical conditions, indicates that there would be no predictability in such modifications. Therefore, there would be no expectation of success in modifying Heida.

Thus in view of the fact that none of the requirements of a *prima facie* case have been made out, Applicants respectfully request that the Examiner reconsider and withdraw the rejection.

Applicants therefore submit that the application stands in condition for allowance. Should the Examiner have questions or comments regarding this application or this Amendment, Applicants' attorney would welcome the opportunity to discuss the case with the Examiner.

The Commissioner is hereby authorized to charge U.S. PTO Deposit Account 08-2336 in the amount of any fee required for consideration of this Amendment.

This is intended to be a complete response to the Office Action mailed August 31, 2005.

Respectfully submitted,

**DANIELE BIGIAVI ET AL.**

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(Date)

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I hereby certify that this correspondence is being deposited with sufficient postage thereon with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on November 18, 2005.

John A. Butler  
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Date of Signature